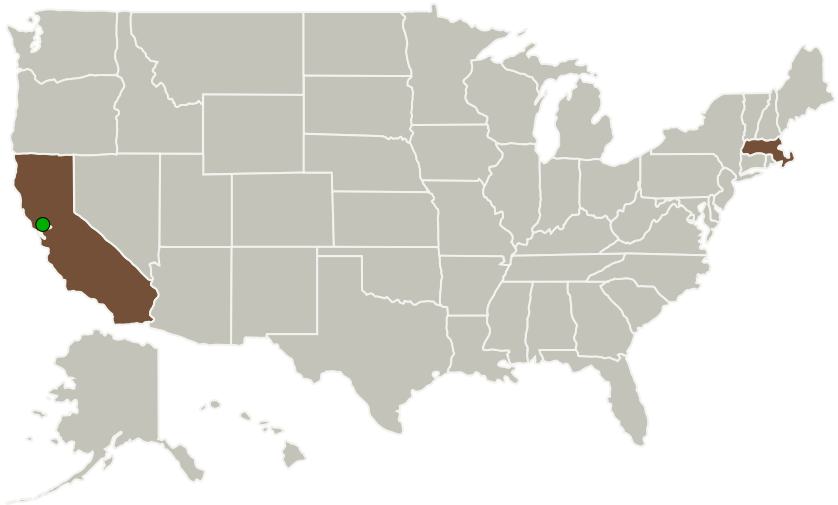
Matched Spectral Filter Imager, Phase I

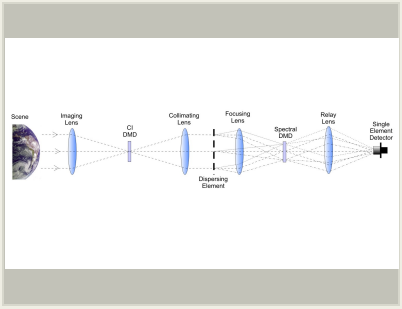
Completed Technology Project (2013 - 2013)

Project Introduction

OPTRA proposes the development of an imaging spectrometer for greenhouse gas and volcanic gas imaging based on matched spectral filtering and compressive imaging. The matched spectral filter compressive imager (MSF-CI) system will be capable of simultaneously imaging and quantifying a series of compounds of interest via passive IR spectroscopy from an airborne or space-based platform.The MSF-CI operates in the 3-5.5 micron spectral range and employs two digital micromirror devices (DMDs) – one to encode the spatial information and a second to encode the spectral information – a dispersive spectrometer, and a single element thermoelectrically cooled mercury cadmium telluride detector. The proposed system offers a significant cost advantage relative to both imagers and hyperspectral imagers presently available in this spectral range as it does not require a costly infrared focal plane array (FPA). Moreover, the MSF-CI makes efficient use of compressive sensing and matched spectral filtering, resulting in minimized data bandwidth while preserving the information of interest. In addition, the use of the DMD in place of a conventional FPA offers significantly better image uniformity, pixel operability, signal to noise at low light levels, and dynamic range. The overall package is expected to be compact and rugged, making it ideal for airborne/space based applications. The proposed Phase I effort will produce a breadboard MSF-CI system which will be characterized and used for a carbon dioxide imaging demonstration.

Primary U.S. Work Locations and Key Partners





Matched Spectral Filter Imager

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Organizations Performing Work	Role	Type	Location
Optra, Inc.	Lead Organization	Industry	Topsfield, Massachusetts
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

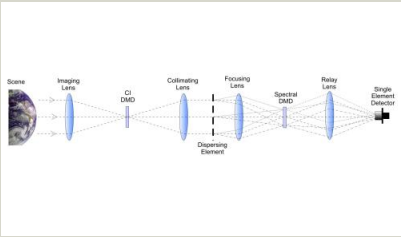
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138290)*

Images



Project Image
Matched Spectral Filter Imager
(https://techport.nasa.gov/image/128536)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Optra, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Julia R Dupuis

Co-Investigator:
Julia R Dupuis

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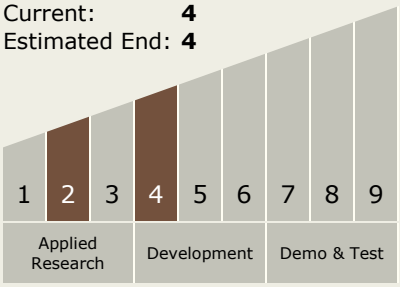
Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System